

MATH RESOURCES¹

EVIDENCE SOURCES

Common Core State Standards: Mathematics (5-9) <http://www.corestandards.org/Math/>

These standards define what students should understand and be able to do in their study of mathematics.

Early Childhood Mathematics: Promoting Good Beginnings (0-8)

<http://www.naeyc.org/files/naeyc/file/positions/psmath.pdf>

This joint position statement of the National Association for the Education of Young Children (NAEYC) and the National Council of Teachers of Mathematics (NCTM) highlights a set of principles for effective early math instruction.

Early Math Knowledge Related to Later Achievement (3-9)

https://news.vanderbilt.edu/2016/12/06/early-math-knowledge-related-to-later-achievement/?j=689846&e=camille.catlett@unc.edu&l=329_HTML&u=24200006&mid=7200908&jb=1

A longitudinal study conducted by Vanderbilt has found that children's math knowledge in preschool is related to their later achievement—but not all types of math knowledge were related equally. The findings suggest that educators and school administrators should consider which areas of math study they shift attention to as they develop curricula for the early years.

Early STEM Matters: Providing High-Quality STEM Experiences for All Young Learners (3-5)

<https://50.erikson.edu/wp-content/uploads/2017/01/STEM-Working-Group-Report.pdf>

This January 2017 report offers guidance around the development and improvement of effective early childhood science, technology, engineering, and math (STEM) education policies and practices. It describes 4 guiding principles related to early childhood STEM education and 6 recommendations for leaders at the local, state, and federal levels.

Engaging Diverse Learners Through the Provision of STEM Education Opportunities (3-9)

http://secc.sedl.org/resources/briefs/diverse_learners_STEM/

This briefing paper highlights methods and materials for supporting an increased understanding of and emphasis on STEM.

The Impact of Family Involvement on the Education of Children Ages 3 to 8: A Focus on Literacy and Math Achievement Outcomes and Social-Emotional Skills (3-8)

<http://www.mdrc.org/publication/impact-family-involvement-education-children-ages-3-8>

This report summarizes research on how families' involvement in children's learning and development through activities at home and at school affects the literacy, mathematics, and social-emotional skills of children ages 3 to 8.

Math and Science in Preschool: Policies and Practice (3-5)

<http://nieer.org/wp-content/uploads/2016/08/MathSciencePolicyBrief0309.pdf>

This report addresses the development of mathematics and science understanding in preschool children, reviews the current knowledge base on educational practices in these domains, identifies areas that require further study, and outlines recommendations for early education policy in mathematics and science.

¹ This collection was compiled and annotated by [Camille Catlett](#) for the Vermont Agency of Education and funded by the Vermont Race to the Top Early Learning Challenge Grant. It is current as of September 2017. **Highlighted resources are available in English and Spanish.**

Math in the Early Years <http://www.ecs.org/clearinghouse/01/09/46/10946.pdf> (0-9)

This publication reveals five surprising findings about the importance of early math learning, and provides implications and recommendations for state policy.

Math Matters: Children's Mathematical Journeys Start Early (3-8)

<http://earlymath.org/earlymath/wp-content/uploads/2012/03/MathMattersExecSummary.pdf>

This summary of the conference "Pathways for Supporting Early Mathematics Learning" offers insights to improve the teaching of early mathematics for children ages 3 through 8 and considerations for how preschool mathematics instruction may be meaningfully linked to a K-3 system that is based on the Common Core State Standards.

Mathematics Education Through the Lens of Social Justice: Acknowledgment, Actions, and Accountability

https://toma.memberclicks.net/assets/docs2016/2016Enews/3.pospaper16_wtodos_8pp.pdf (0-9)

This position statement provides the rationale for and characteristics of a systemic approach that includes fair and equitable teaching practices, high expectations for all students, access to rich, rigorous, and relevant mathematics, and strong family/community relationships to promote positive mathematics learning and achievement.

Mathematics in Early Childhood Learning (0-6)

<http://www.nctm.org/Standards-and-Positions/Position-Statements/Mathematics-in-Early-Childhood-Learning/>

This position statement from the National Council of Teachers of Mathematics addresses the question, "Why is mathematics important for early learners?"

Principles and Standards for School Mathematics

<http://www.nctm.org/standards/content.aspx?id=16909> (5-9)

This document from the National Council of Teachers of Mathematics outlines the essential components of a high-quality school mathematics program. It emphasizes the need for well-prepared and well-supported teachers and administrators, and it acknowledges the importance of a carefully organized system for assessing students' learning and a program's effectiveness.

What's Past is Prologue: Relations Between Early Mathematics Knowledge and High School Achievement (4-9)

<http://www.psy.cmu.edu/~siegler/Watts-earlybird.pdf> This paper relates mathematical skills measured at 54 months to adolescent mathematics achievement.

Strengthening the Math-Related Teaching Practices of the Early Care and Education Workforce: Insights from Experts <http://www.irle.berkeley.edu/cscce/wp-content/uploads/2015/02/Math-Expert-Paper-Report.pdf> (0-5)

This report by Sharon Ryan, Marcy Whitebook, and Deborah Cassidy explores the perspective of nationally recognized experts in math and early care and education about three main issues: 1. The knowledge and competencies that practitioners need in order to teach mathematics to young children; 2. Effective strategies for educating practitioners to support young children's mathematical development; and 3. Challenges and successes in math-related ECE workforce development efforts.

PRINT SOURCES

Children's Development of Mathematical Concepts: Ages 0-4

<http://www.norwood.k12.ma.us/curriculum/documents/childrensdevelopmentofmathconcepts-ages0-4.pdf>

This resource highlights both developmentally appropriate math and fun ways to support the development of those concepts.

Children's Development of Mathematical Concepts: Ages 4-6

<http://www.norwood.k12.ma.us/curriculum/documents/childrensdevelopmentofmathconcepts-ages4-6.pdf>

This resource highlights both developmentally appropriate math and fun ways to support the development of those concepts.

Early Childhood Teachers' Misconceptions About Mathematics Education for Young Children in the United States <http://www.earlychildhoodaustralia.org.au/wp-content/uploads/2014/06/AJEC0904.pdf> (0-8)

This article discusses nine common and widespread misconceptions about learning and teaching mathematics for young children. These misconceptions often interfere with understanding and interpreting recommendations for mathematics education and become subtle (and sometimes overt) obstacles to implementing effective practices in early childhood classrooms.

Early Math Collaborative http://earlymath.erikson.edu/ideas/?fwp_formats=article (3-9)

Search this website to find articles based on grade level, math concept, or Common Core alignment.

Formula for Success: Engaging Families in Early Math Learning (0-9)

<https://globalfrp.org/content/download/83/561/file/Early%20Math%20FINE.pdf>

Early math ability is one of the best predictors of children's later success in school. This compilation of articles written by researchers and program developers was designed to provide families with guidance, inspiration, and motivation to support their young children's mathematical development effectively. Taken together, they show that math is part of our everyday lives, and as such, is conditioned by relationships, culture, and values; math can be an enjoyable parent-child experience; and digital media can be harnessed to promote math learning—for children and parents.

Help! They Still Don't Understand Counting <http://files.eric.ed.gov/fulltext/EJ875422.pdf> (3-5)

This article describes a developmental framework for counting and weaves within it helpful activities derived from recent research as well as a few activities based on long-established best practices. The article briefly discusses how difficulty with counting may or may not be indicative of a math disability.

Helping Teachers of Mathematics Integrate the Knowledge and Culture of Families Into Their Practice (0-9)

<http://www.hfrp.org/complementary-learning/snapshots/helping-teachers-of-mathematics-integrate-the-knowledge-and-culture-of-families-into-their-practice>

This article highlights four key considerations for making math more relevant to each young child and family. This article describes creative development in toddlers (ages 0-3) and in the preschool to kindergarten stage (ages 3-6). It also discusses how educators can support creative development at each stage.

Let's Talk, Read, and Sing About STEM: Tips for Families with Young Children (3-5)

You can discover STEM with your child in many ways. Talk, read, sing, play, sign or use other ways to communicate – whatever works best for your family. Here are some tips to help you get started.

<http://www2.ed.gov/about/inits/ed/earlylearning/talk-read-sing/stem-toolkit-families.pdf> (English)

<http://www2.ed.gov/about/inits/ed/earlylearning/talk-read-sing/stem-toolkit-families-es.pdf> (Spanish)

Let's Talk, Read, and Sing About STEM: Tips for Preschool Teachers and Providers (3-5)

<http://www2.ed.gov/about/inits/ed/earlylearning/talk-read-sing/stem-toolkit-preschool-teachers.pdf>
(English)

<http://www2.ed.gov/about/inits/ed/earlylearning/talk-read-sing/stem-toolkit-preschool-teachers-es.pdf>
(Spanish)

Here are some tips for using daily routines to build math and science concepts and skills through play and exploration.

Making Math Count More for Young Latino Children (5-9)

<https://www.childtrends.org/wp-content/uploads/2017/02/Early-Math-Report-2.8.pdf>

One in four U.S. kindergarteners today is Latino. How these children do in school has far-reaching implications for the country's future economy. This February 2017 report shares that Latino kindergartners' early math skills lag behind those of white kindergartners at the beginning of school - a disparity that is likely to persist or increase over time without intervention. The report discusses the implications of these findings and offers research-based recommendations to address the issue.

Math Learned Best When Children Move (5-9)

<http://nexs.ku.dk/english/news/2017/math-learned-best-when-children-move/>

This article summarizes research findings on the connections between movement and mastery of math concepts.

Math, Science, and Technology in the Early Grades <https://muse.jhu.edu/article/641244/pdf> (3-9)

Douglas H. Clements and Julie Sarama document that young children possess a sophisticated informal knowledge of math, and that they frequently ask scientific questions, such as why questions. Discover new ways of seeing math emerge, e.g., preschoolers' free play involves substantial amounts of foundational math as they explore patterns, shapes, and spatial relations; compare magnitudes; and count objects.

Mathematical Structure and Error in Kindergarten (5-6)

<http://www.naeyc.org/yc/article/mathematical-structure-error-kindergarten>

This article focuses on choices educators make and draws attention to a little-recognized benefit of children's errors—errors that can reveal strengths worth preserving, not just weaknesses to fix. With stories of two children, this article shows how wrong answers can reveal children's attention to mathematical structure. It also looks at how young children use patterns in language to make mathematical meaning.

More, All Gone, Empty, Full: Math Talk Every Day in Every Way (0-3)

<http://readyforlearning.net/sites/readyforlearning.drupal.ku.edu/files/docs/Greenberg2012.pdf>

This article highlights how being aware of early mathematical concepts can help educators to be more thoughtful and intentional about using these concepts in everyday experiences and interactions with infants and toddlers.

STEM Resources and Materials for Engaging Learning Experiences (2-8)

<http://www.naeyc.org/yc/stem-engaged-learning>

This article offers suggestions and examples to guide teachers' selection of classroom STEM resources and materials.

With Math, Seeing Is Understanding (4-9) <http://www.ascd.org/ascd-express/vol12/1215-strayton.aspx>

Visual cues stick and show that envisioning math helps children learn in lasting ways. Teachers can do more to give students internal ways to see the structure of mathematics—to understand types of units and what it means to move between them, and to pull apart and combine numbers. This articles shares examples of how to do that.

AUDIOVISUAL SOURCES

1, 2, 3, 4, Foundations to Early Numeracy and More! <http://home.edweb.net/foundations-to-early-numeracy/> (3-6)

Developing a conceptual understanding of numbers and how they work is critical for continued success in mathematics throughout a child's academic career. This webinar reviews and discusses the knowledge and skills — in particular those related to verbal counting, enumeration, cardinality, and small number recognition — which develop in the preschool years and lay the foundation for good number sense. NOTE: Free registration with the edWeb community is required to view these materials

Building Mathematical Competencies in Early Childhood (3-6)

<http://earlymath.erikson.edu/building-mathematical-competencies-in-early-childhood/>

This video deals with the “whys,” “whats,” and “hows” of including rich, developmentally appropriate mathematics experiences for young children in pre-kindergarten classrooms. It features Early Math Collaborative instructors discussing measurement.

Curious Minds: Incorporating STEM into Early Childhood Classrooms <http://vimeo.com/16738701> (0-9)

This webinar explores effective strategies for engaging young children through science, technology, engineering and math in preschool and early elementary classrooms. Did you know that by ten months of age, babies can distinguish a set of 2 items from a set of 3, or that providing young children with high-quality STEM experiences early on can provide a foundation for later success in reading? Watch to learn more about how STEM may be incorporated into ECE settings.

Double-Column Addition Using Piaget's Theory <https://sites.google.com/site/constancekamii/videos> (6-9)

Using an approach based on Piaget's theory, teacher Leslie Baker Housman encourages her first-grade students to think critically about mathematics. The compelling results include a room of students who have faith in their own deliberative skills, and a teacher who does not correct students, but instead encourages them to question answers and subsequently express their viewpoints. Watch to see children who have a genuine understanding of mathematics rather than a superficial one.

Early Math Collaborative Videos <http://earlymath.erikson.edu/ideas/#/formats=11> (3-9)

Search this website to find videos based on grade level, math concept, or Common Core alignment.

Early Mathematics: What's a Big Idea? (0-9)

<http://www.erikson.edu/wp-content/uploads/NAEYC-2011-Big-Ideas-HynesBerry-Ginet.pdf>

This PowerPoint presentation offers clear and thought-provoking ideas about what and how to teach math to young children.

Let's Talk About STEM Video Series (0-5)

<https://www.zerotothree.org/resources/series/let-s-talk-about-stem-video-series>

Young children begin to learn about early science, technology, engineering and math (STEM) through play and everyday routines, activities and interactions. These videos, illustrating the development of STEM skills in the first five years of life, are essential to understanding the development of STEM skills in the first 5 years of life. Each video is available in both English and Spanish. The URL for the Spanish version is <https://www.zerotothree.org/resources/series/hablemos-de-las-matematicas>

Math Ideas for Teachers <http://view.vzaar.com/4772941/download> (3-5)

This video highlights ways to teach preschoolers math concepts using nature and play.

Students Create Song for Learning Long Division (8-9)

<https://www.youtube.com/watch?v=CWB0CNI8RK4>

Here's an example how Universal Design for Learning can be used to help students learn long division.

Teaching Fractions Made Easy (7-9) <https://www.childtrends.org/videos/teaching-fractions-made-easy/>

This video offers recent research on ways to effectively teach fractions to 2nd and 3rd graders, along with suggestions for how work with families to build an understanding of fractions at home.

UDL Guidelines in Practice: Grade 1 Mathematics

<http://www.youtube.com/watch?v=KuTJJQWnMaQ> (6-8)

Watch as a panel of UDL experts takes you inside a diverse Language Arts classroom to show master teachers applying the principles and guidelines of UDL to first grade math.

Supporting the Development of Children's Mathematics

<https://www.youtube.com/watch?v=6GYWBHz6Fak> (5-9)

Megan Franke's video presentation highlights what young children know about math and how effective teachers can build on those capabilities. A companion research fact sheet is available at

http://www.aera.net/Portals/38/docs/Annual_Meeting/2016%20Annual%20Meeting/2016%20Knowledge%20Forum/Franke.pdf

Early Childhood NEWS: The Professional Resource for Teachers and Families (3-9)

<http://www.earlychildhoodnews.com/earlychildhood/articles.aspx?ArticleID=195>

This website is a source for many math activities.

Early Math Collaborative Videos <http://earlymath.erikson.edu/ideas/#/formats=11> (3-9)

Search this website to find resources based on grade level, math concept, or Common Core alignment. This is a great source of information for non-foundational mathematics – what it is, how it develops in children, and how best to teach it.

Early Math Matters (3-6) <http://mathathome.org/early-math-matters/>

This free eight-course online curriculum introduces teachers and caregivers to mathematical concepts such as math literacy, number sense, patterns, geometry, measurement, data collection and math processes. Each lesson also includes tips on setting up a math-enriched environment, as well as animations, interviews with math experts, and videos of children and teachers in classroom settings.

Helping Your Child Learn Mathematics <http://www2.ed.gov/parents/academic/help/math/index.html> (3-9)

This booklet is made up of fun activities that parents can use with children from preschool age through grade 5 to strengthen their math skills and build strong positive attitudes toward math.

Making Math a Family Thing (3-6) <https://www.gse.harvard.edu/news/uk/18/01/making-math-family-thing>

This web article offers strategies for families and teachers on closing the math gap between home and school. Check out the resources at the end.

Making Math Meaningful for Diverse Learners (3-6)

<https://www.naeyc.org/resources/pubs/tyc/oct2017/make-math-meaningful-diverse-learners>

Children with different levels of exposure to math vocabulary and math activities may enter a classroom from diverse language, cultural, and experiential backgrounds. When mathematical learning at school connects to familiar experiences and objects in children's lives, the math can seem more interesting and make more sense to children! This web article shares how to make that happen.

Math at Home (0-5) <http://mathathome.org/>

This website is designed to help foster the development of early math skills in children between the ages of birth and five. Visit to learn how to set up math-rich environments for infants, toddlers and preschoolers, download early math lesson plans, view videos about early math concepts and activities, find links to a wide variety of early math resources, read weekly blog posts by early math experts, enroll in free online courses, and learn high-impact strategies for teaching early math.

Math at Home Toolkit (2-8) <https://www.naeyc.org/math-at-home>

This collection of online resources includes articles, printable math games, videos and activities, all of which may be downloaded. A number of the resources are available in Spanish.

Math Concepts in Children's Books <http://www2.ed.gov/pubs/EarlyMath/appendix.html> (3-9)

Reading is a great way to communicate mathematical concepts to a child. It also is a wonderful opportunity to spend time together. These books, some of which are available in Spanish, can build math, language, and literacy simultaneously.

Math Is Fun Resources <http://www.mathsisfun.com/links/index.html> (6-9)

This online repository has resources and activities for supporting math development in children from first to seventh grade.

Math Resources for Teacher Educators (0-9)

<http://prek-math-te.stanford.edu/>

The Development and Research in Early Math Education network of scholars has launched a website of free resources for teacher educators. These resources include modules, videos, activities, handouts, and articles designed to support teacher educators in training preservice and inservice early childhood educators.

Math Through Songs and Music (3-5)

<https://eclkc.ohs.acf.hhs.gov/hslc/tta-system/teaching/docs/math-do-tools-songs-music.pdf>

Singing songs and engaging in musical activities are fun and engaging ways to experience and learn early mathematical concepts. This resource includes a list of songs with corresponding mathematical concepts that teachers can emphasize within the song. English and Spanish songs are included.

Mathematics (5-9) <http://education.vermont.gov/student-learning/content-areas/mathematics>

As part of the Vermont Agency of Education's commitment to supporting schools in the delivery of effective K-12 mathematics instructional programs, this site provides teachers, administrators, expanded learning providers, higher education faculty, parents and community members with a broad range of resources.

One, Two, Buckle My Shoe: Understanding Number Development in Young Children (2-7)

<http://www.communityplaythings.com/resources/articles/2017/understanding-number-development>

This web article reviews eight number concepts that provide the foundation of later mathematics and higher order thinking.

Science and Math: Resources from the Educational Equity Center (3-9)

<http://www.edequity.org/programs/science-and-math-programs/>

The resources and practices shared through this site are designed to promote math skills for young boys and girls who are culturally, linguistically and contextually diverse.

Science, Technology, Engineering and Math Resources for Early Childhood

<http://www.naeyc.org/STEM> (0-8)

This collection, from online articles to websites to project reports, is for educators and families. The resources illuminate only some of the wide range of activities—from inquiry-based trips to museums and libraries to games developing early numeracy to using math talk—that are available as families and teachers help foster and grow children’s curiosity about how the world around them works.

STEM for Early Learners (2-5)

https://pdg.grads360.org/?utm_content=&utm_medium=email&utm_name=&utm_source=govdelivery&utm_term=#program/stem-in-early-childhood

This series of free webinars, research readings, and practical application activities was designed to enhance professionals’ understanding and confidence in supporting children’s intellectual learning. The eleven sequential modules offers research, practical application for classroom and home and provides examples of experiences that build scientific, technology, engineering, and mathematical learning for older toddlers and preschool children.

STEM Sprouts Science, Technology, Engineering, & Math Teaching Guide (3-5)

<http://www.bostonchildrensmuseum.org/sites/default/files/pdfs/STEMGuide.pdf>

The STEM Sprouts Teaching Kit is the product of a collaboration between National Grid, Boston Children’s Museum, and WGBH. The goal of this curriculum is to assist preschool educators in focusing and refining the naturally inquisitive behaviors of three to five-year-olds on science, technology, engineering, and math (STEM).

Successful STEM Education (5-9) <https://successfulstemeducation.org/>

This site provides information, events, and resources that highlight promising practices and tools in support of effective K-12 STEM education in schools and programs.

Teaching Math to Young Children Practice Guide (3-6)

<https://ies.ed.gov/ncee/wwc/PracticeGuide/18>

This practice guide provides five recommendations for teaching math to children in preschool, prekindergarten, and kindergarten. Each recommendation includes implementation steps and solutions for common roadblocks. The recommendations also summarize and rate supporting evidence. The guide is geared toward teachers, administrators, and other educators who want to build a strong foundation for later math learning.

The Ultimate Guide to Math Resources (5-9)

<http://arealonlinedegree.com/college-resources/the-math-resources-ultimate-guide/>

The following is an array of resources for all levels of math students to use to make their experience with the subject both enjoyable and rewarding.